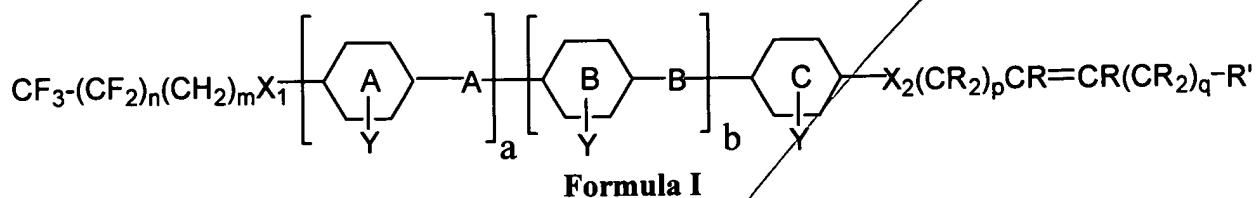


We claim:

1. A liquid crystal composition comprising one or more compounds of the formula:



wherein:

a and b are 0 or 1;

A and B, independently, are selected from the group consisting of a single bond, -COO-, -OOC-, -CH₂-CH₂-, -OCH₂-, -CH₂-O-, -CH=CH- (cis or trans); -C≡C-, -CH=CH-CH=CH- (cis or trans);

Y represents up to four substituents on a given ring where the substituents are selected from a halogen, CN or NO₂;

Core rings A, B and C can be aromatic or alicyclic, if aromatic one or two ring carbons can be replaced with a heteroatom or if alicyclic rings can contain 3-10 carbon atoms and optionally can contain a double bond, wherein one or two CH₂ of the alicyclic ring can be replaced with O or a C=O group;

m and n are integers ranging from 1 to 20, inclusive; p is an integer ranging from 2 to 20, inclusive; q is 0 or an integer ranging from 1 to 20, inclusive; n + m is 4 to 20 and p + q is 4 to 20;

X₁ and X₂, independently, are -O- or a single bond; and

R and R', independent of other R or R' in the alkenyl tail are hydrogens or alkyl groups.

2. The liquid crystal composition of claim 1 wherein the compound of formula I has a core selected from the cores listed in Scheme 1.

3. The liquid crystal composition of claim 1 wherein the compound of formula I has a phenyl pyrimidine core.

4. The liquid crystal composition of claim 1 that exhibits a smectic C phase.

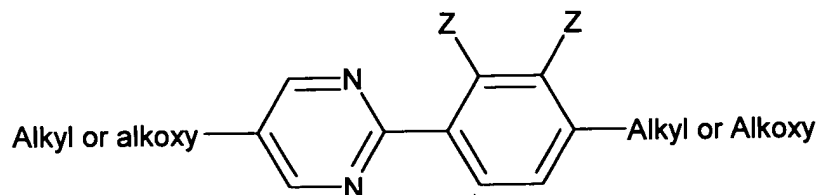
5. The liquid crystal composition of claim 4 wherein the smectic C phase extends over a temperature range of 50°C or more.

6. The liquid crystal composition of claim 4 that further exhibits a smectic A phase.

7. The liquid crystal composition of claim 1 which comprises two or more compounds of formula I.

8. The liquid crystal composition of claim 1 which comprises three or more compounds of formula I.

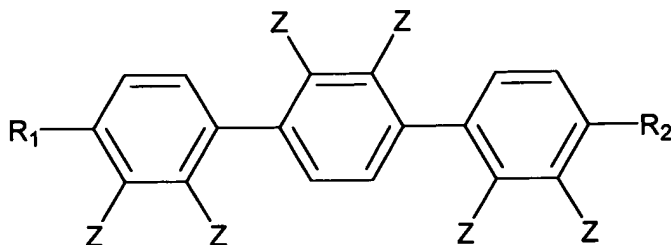
9. The liquid crystal composition of claim 1 further comprising one or more compounds of formula:



where Z can be CH or CF and the alkyl or alkoxy tails can be straight-chain or branched and

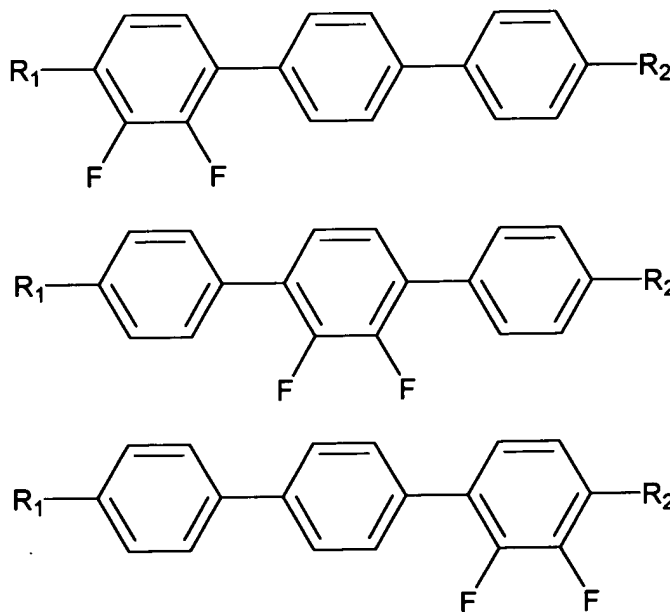
contain from three to twenty carbon atoms.

10. The liquid crystal composition of claim 1 further comprising one or more compounds of formula:



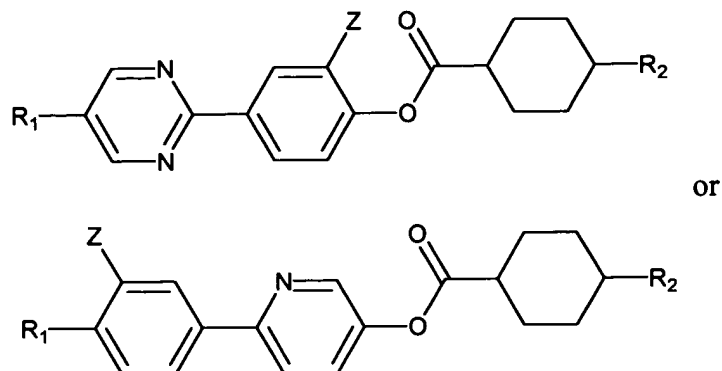
where CZ is CH or CF and R₁ and R₂ are alkyl or alkoxy groups having from three to twenty carbon atoms.

11. The liquid crystal composition of claim 10 which comprises one compound of each of the formulas:



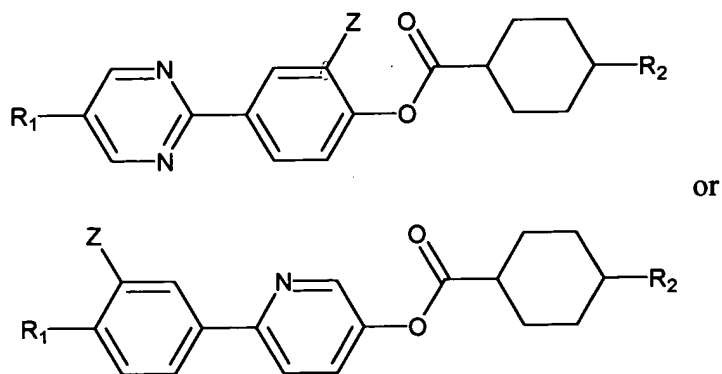
wherein R₁ and R₂ are alkyl or alkoxy groups having from three to twenty carbon atoms and R₁ is not the same as R₂.

12. The liquid crystal composition of claim 1 further comprising one or more compounds of formulas:



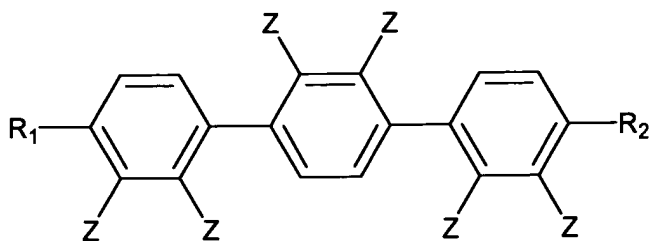
where CZ is CH or CF and R₁ and R₂ are alkyl or alkoxy groups having three to twenty carbon atoms.

13. The liquid crystal composition of claim 9 further comprising one or more compounds of formulas:



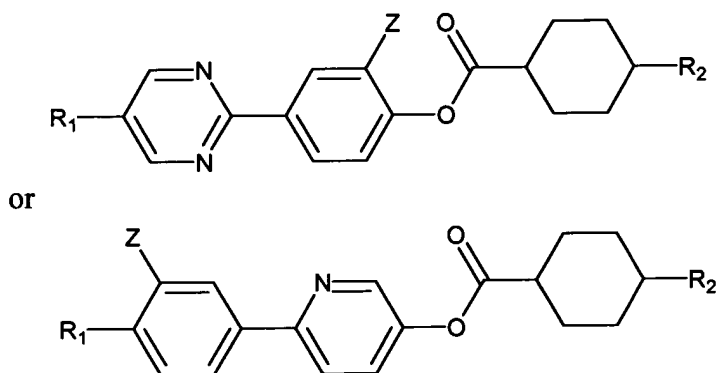
where CZ is CH or CF and R₁ and R₂ are alkyl or alkoxy groups having three to twenty carbon atoms.

14. The liquid crystal composition of claim 9 further comprising one or more compounds of formula:



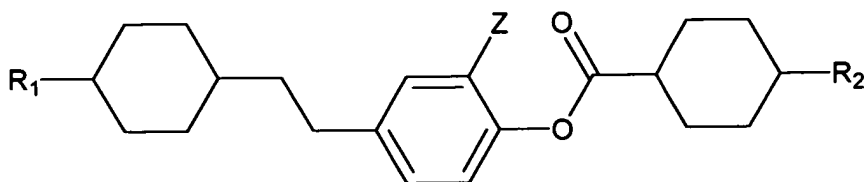
where CZ is CF or CH and R₁ and R₂ are alkyl or alkoxy groups having from three to twenty carbon atoms.

15. The liquid crystal composition of claim 14 further comprising one or more compounds of formula:



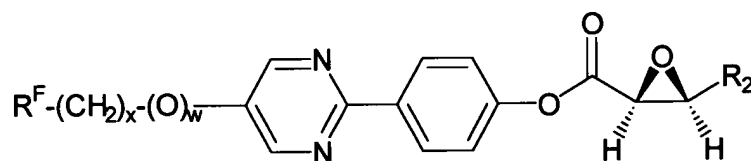
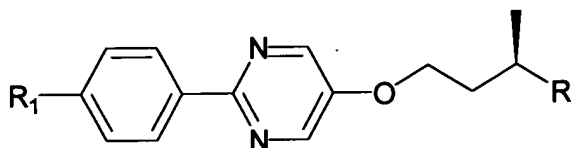
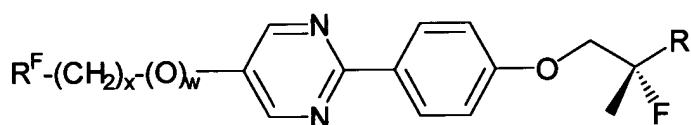
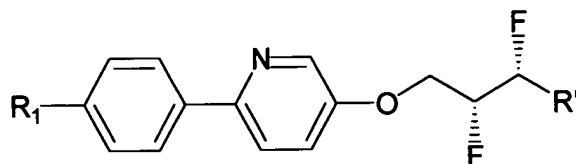
wherein CZ is CH or CF and R₁ and R₂ are alkyl or alkoxy groups having from three to twenty carbon atoms.

16. The liquid crystal composition of claim 15 further comprising one or more compounds of formula:



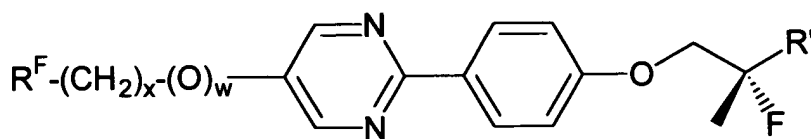
R_1 and R_2 are alkyl or alkoxy groups having from three to twenty carbon atoms.

17. The liquid crystal composition of claim 1 further comprising one or more compounds of formulas:



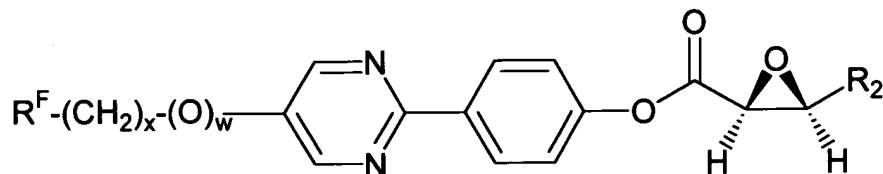
where: w is 0 or 1; x is an integer ranging from one to twenty; R_1 is an alkyl or alkoxy group having three to twenty carbon atoms; R_2 is an alkyl group having from three to twenty carbon atoms; R' is an alkyl group having three to twenty carbon atoms; and R^F is a perfluoroalkyl group having from one to twenty carbon atoms.

18. The liquid crystal composition of claim 1 further comprising one or more compounds of formula:



where: w is 0 or 1; x is an integer ranging from one to twenty; R' is an alkyl group having three to twenty carbon atoms; and R^F is a perfluoroalkyl group having from one to twenty carbon atoms.

19. The liquid crystal composition of claim 1 further comprising one or more compounds of formula:



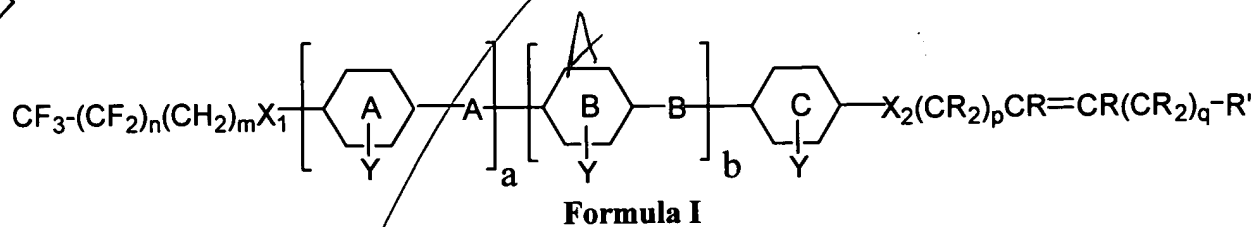
where: w is 0 or 1; x is an integer ranging from one to twenty; R₂ is an alkyl group having from three to twenty carbon atoms; and R^F is a perfluoroalkyl group having from one to twenty carbon atoms.

20. The liquid crystal composition of claim 1 which exhibits a freezing point of -60°C or less.

21. The liquid crystal composition of claim 1 which exhibits both a smectic C and a smectic A phase.

22. The liquid crystal composition of claim 20 which further exhibits a freezing point of -60°C or less.

23. A LC compound having the formula:



wherein:

a and b are 0 or 1;

A and B, independently, are selected from the group consisting of a single bond, -COO-, -OOC-, -CH₂-CH₂-, -OCH₂-, -CH₂-O-, -CH=CH- (cis or trans); -C≡C-, -CH=CH-CH=CH- (cis or trans);

Y represents up to four substituents on a given ring where the substituents are selected from a halogen, CN or NO₂;

Core rings A, B and C can be aromatic or alicyclic, if aromatic one or two ring carbons can be replaced with a heteroatom or if alicyclic rings can contain 3-10 carbon atoms and optionally can contain a double bond, wherein one or two CH₂ of the alicyclic ring can be replaced with O or a C=O group;

m and n are integers ranging from 1 to 20, inclusive; p is an integer ranging from 2 to 20, inclusive; q is 0 or an integer ranging from 1 to 20; inclusive; n + m is 4 to 20 and p + q is 4 to 20;

X₁ and X₂, independently, are -O- or a single bond; and

R and R', independent of other R or R' in the alkenyl tail are hydrogens or alkyl groups.

24.

1.

The liquid compound of claim 23 having a core selected from the cores listed in Scheme

25.

The liquid crystal compound of claim 23 which has a phenyl pyrimidine core.

26.

core.

The liquid crystal compound of claim 23 which has an optionally substituted terphenyl

27. The liquid crystal compound of claim 23 wherein X_1 is an oxygen.

~~28.~~ The liquid crystal compound of claim 23 wherein X_2 is a single bond.

29. The liquid crystal compound of claim 23 wherein the double bond in the alkene tail is a cis double bond.

30. The liquid crystal compound of claim 23 wherein the double bond in the alkene tail is a trans double bond.

31. The liquid crystal compound of claim 23 wherein the core contains two aromatic rings.

~~32.~~ The liquid crystal compound of claim 23 wherein the core contains a cyclohexane ring.

33. The liquid crystal compound of claim 23 wherein $m + n$ ranges from 5 to 12.

34. The liquid crystal compound of claim 23 wherein n is 3 and m is 4.

35. The liquid crystal compound of claim 23 wherein the core is a phenylpyrimidine which is optionally substituted with one or two fluorines on the phenyl ring.

112 ~~36.~~ The liquid crystal compound of claim 34 wherein $m + n$ ranges from 5 to 12.

37. The liquid crystal compound of claim 34 wherein $m + n$ ranges from 8 to 12.

38. The liquid crystal compound of claim 36 wherein X_1 is an oxygen atom.

112 ~~39.~~ The liquid crystal compound of claim 36 wherein X_2 is a single bond.

40. The liquid crystal compound of claim 39 wherein $p + q$ ranges from 5 to 12 and R' is a methyl group.

~~41.~~ The liquid crystal compound of claim 39 wherein q is zero and R' is a hydrogen.

~~42.~~ The liquid crystal compound of claim 39 wherein p is 3-6 inclusive and q is 3-6, inclusive, and R' is a hydrogen or a methyl group.

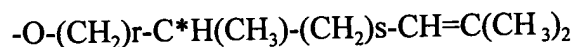
~~43.~~ The liquid crystal compound of claim 39 wherein the double bond in the alkene tail is a cis double bond.

~~44.~~ The liquid crystal compound of claim 39 wherein the double bond in the alkene tail is a trans double bond.

~~45.~~ The liquid crystal compound of claim 23 wherein the alkene tail is a chiral nonracemic moiety.

~~46.~~ The liquid crystal compound of claim 45 wherein in the alkene tail one R bonded to the third to the fifth carbon in the tail is a methyl group and the carbon to which the methyl group is bonded is an asymmetric carbon.


~~47.~~ The liquid crystal compound of claim 46 wherein the alkene tail has the formula:



where r is 2-6, inclusive and s is 2 to 6, inclusive.

~~48.~~ The liquid crystal compound of claim 47 wherein r is 2 and s is 2 to 4, inclusive.

~~49.~~ The liquid crystal compound of claim 48 wherein $m + n$ ranges from 5 to 12, inclusive.

- 
50. A liquid crystal device having an aligned layer of the LC composition of claim 1.
51. The device of claim 50 which is a surface-stabilized FLC device.